Available on commercial versions

NPN MEDIUM POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/349

Qualified Levels:
JAN, JANTX and JANTXV

DESCRIPTION

This family of high-frequency, epitaxial planar transistors feature low saturation voltage. The U4 package is hermetically sealed and provides a low profile for minimizing board height. The 'A' version maintains it's forward current transfer ratio, h_{FE}, at low temperature at higher collector-emitter voltage. These devices also available in TO-5 and TO-39 packages. Microsemi also offers numerous other transistor products to meet higher and lower power ratings with various switching speed requirements in both through-hole and surface-mount packages.

Important: For the latest information, visit our website http://www.microsemi.com.

U4 Package

FEATURES

- JEDEC registered 2N3506U4 through 2N3507U4 series.
- RoHS compliant versions available (commercial grade only).
- Vce(sat) = 0.5 V @ Ic = 500 mA
- Rise time t_r = 30 ns max @ I_C = 1.5 A, I_{B1} = 150 mA
- Fall time t_f = 35 ns max @ I_C = 1.5 A, I_{B1} = I_{B2} = 150 mA

Also available in:

TO-39 package
(leaded)
2N3506 – 2N3507A

TO-5 package
(leaded)
2N3506L – 2N3507AL

APPLICATIONS / BENEFITS

- General purpose transistors for medium power applications requiring high frequency switching and low package profile.
- Military and other high-reliability applications.

MAXIMUM RATINGS

Parameters / Test Conditions	Symbol	2N3506U4	2N3507U4	Unit
Collector-Emitter Voltage	V_{CEO}	40	50	V
Collector-Base Voltage	V_{CBO}	60	80	V
Emitter-Base Voltage	V_{EBO}	5.0		V
Collector Current	I_C	3.0		A
Total Power Dissipation @ T_A = +25 °C (1) @ T_C = +100 °C (2)	P_D	1.0 5.0		W
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		°C

Notes: 1. Derate linearly 5.71 mW/°C for T_A > +25 °C.
2. Vce = 40V.

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MECHANICAL and PACKAGING

- CASE: Hermetically sealed, aluminum nitride (AlN) ceramic body with gold over nickel plated kovar lid.
- TERMINALS: Gold over nickel plated surface mount terminations
- MARKING: Part number, Date Code, Manufacturer's ID
- POLARITY: See package dimensions
- TAPE & REEL option: Standard per EIA-481D.
- WEIGHT: .125 grams (125 milligrams).
- See Package Dimensions on last page.

PART NOMENCLATURE

JAN 2N3506 A U4 (e3)

Reliability Level
JAN = JAN Level
JANTX = JANTX Level
JANTXV = JANTXV Level
Blank = commercial

JEDEC type number
(see Electrical Characteristics table)

RoHS Compliance
e3 = RoHS compliant (available on commercial grade only)
Blank = non-RoHS compliant

Package type
U4 = surface mount

Level improvement
A = maintains h_{FE} @ -55°C at higher V_{CE}

SYMBOLS & DEFINITIONS

Symbol	Definition
C_{obo}	common-base open-circuit output capacitance
I_C	collector current, dc
I_{CEO}	collector cutoff current, base open
I_{CEX}	collector cutoff current, circuit between base and emitter
I_{EBO}	emitter cutoff current, collector open
h_{FE}	common-emitter static forward current transfer ratio
V_{BE}	base-emitter voltage, dc
V_{CE}	collector-emitter voltage, dc
V_{CEO}	collector-emitter voltage, base open
V_{CBO}	collector-emitter voltage, emitter open
V_{EB}	emitter-base voltage, dc
V_{EBO}	emitter-base voltage, collector open

ELECTRICAL CHARACTERISTICS (T_A = +25°C, unless otherwise noted)

OFF CHARACTERISTICS

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Collector-Emitter Breakdown Voltage I_C = 10 mA	2N3506U4 2N3507U4	$V_{(BR)CEO}$	40 50		V
Collector-Emitter Cutoff Current V_{CE} = 40 V V_{CE} = 60 V	 2N3506U4 2N3507U4	I_{CEX}		1.0 1.0	µA
Collector-Base Breakdown Voltage I_C = 100 µA	2N3506U4 2N3507U4	$V_{(BR)CBO}$	60 80		V
Emitter-Base Breakdown Voltage I_E = 10 µA		$V_{(BR)EBO}$	5		V

ON CHARACTERISTICS (3)

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Forward-Current Transfer Ratio I_C = 500 mA, V_{CE} = 1 V	2N3506U4 2N3507U4	h_{FE}	50 35	250 175	
Forward-Current Transfer Ratio I_C = 1.5 A, V_{CE} = 2 V	2N3506U4 2N3507U4	h_{FE}	40 30	200 150	
Forward-Current Transfer Ratio I_C = 2.5 A, V_{CE} = 3 V	2N3506U4 2N3507U4	h_{FE}	30 25		
Forward-Current Transfer Ratio I_C = 3.0 A, V_{CE} = 5 V	2N3506U4 2N3507U4	h_{FE}	25 20		
Forward-Current Transfer Ratio I_C = 500 mA, V_{CE} = 1.0 V @ -55 °C	2N3506U4 2N3507U4	h_{FE}	25 17		
Forward-Current Transfer Ratio I_C = 500 mA, V_{CE} = 2.0 V @ -55 °C	2N3506AU4 2N3507AU4	h_{FE}	25 17		
Collector-Emitter Saturation Voltage I_C = 500 mA, I_B = 50 mA		$V_{CE(sat)}$		0.5	V
Collector-Emitter Saturation Voltage I_C = 1.5 A, I_B = 150 mA		$V_{CE(sat)}$		1.0	V
Collector-Emitter Saturation Voltage I_C = 2.5 A, I_B = 250 mA		$V_{CE(sat)}$		1.5	V
Base-Emitter Saturation Voltage I_C = 500 mA, I_B = 50 mA		$V_{BE(sat)}$		1.0	V
Base-Emitter Saturation Voltage I_C = 1.5 A, I_B = 150 mA		$V_{BE(sat)}$	0.8	1.3	V
Base-Emitter Saturation Voltage I_C = 2.5 A, I_B = 250 mA		$V_{BE(sat)}$		2.0	V

ELECTRICAL CHARACTERISTICS (T_A = +25°C, unless otherwise noted)

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio I_C = 100 mA, V_{CE} = 5 V, f = 20 MHz	$\|h_{fe}\|$	3.0	15	
Output Capacitance V_{CB} = 10 V, I_E = 0, 100 kHz ≤ f ≤ 1.0 MHz	C_{obo}		40	pF
Input Capacitance V_{EB} = 3.0 V, I_C = 0, 100 kHz ≤ f ≤ 1.0 MHz	C_{ibo}		300	pF

SWITCHING CHARACTERISTICS (4)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Delay Time I_C = 1.5 A, I_{B1} = 150 mA	t_d		15	ns
Rise Time I_C = 1.5 A, I_{B1} = 150 mA	t_r		30	ns
Storage Time I_C = 1.5 A, I_{B1} = I_{B2} = 150 mA	t_s		55	ns
Fall Time I_C = 1.5 A, I_{B1} = I_{B2} = 150 mA	t_f		35	ns

NOTES: (3) Pulse Test: Pulse Width = 300 µs, Duty Cycle ≤ 2.0%.
(4) Consult MIL-PRF-19500/349 for additional information.

GRAPHS

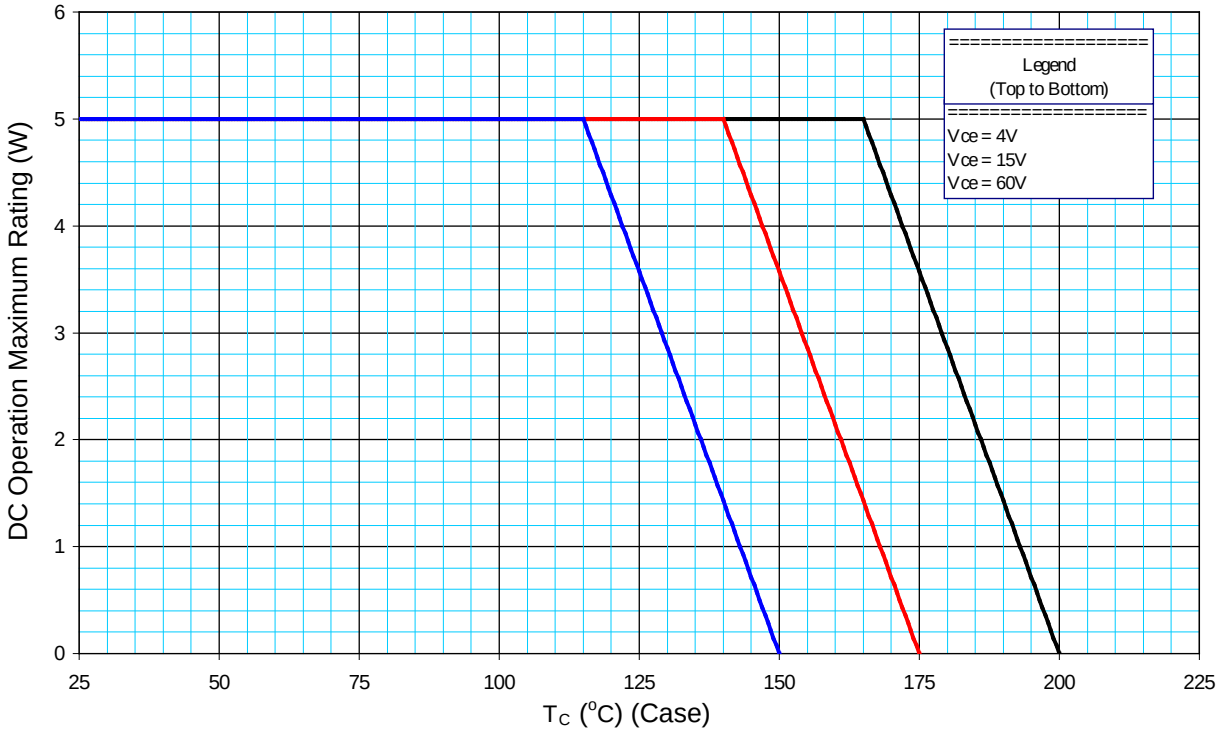


FIGURE 1
Temperature-Power Derating Curve
NOTES: Thermal Resistance Junction to Case = 7.0 °C/W
Case mounted to infinite sink.

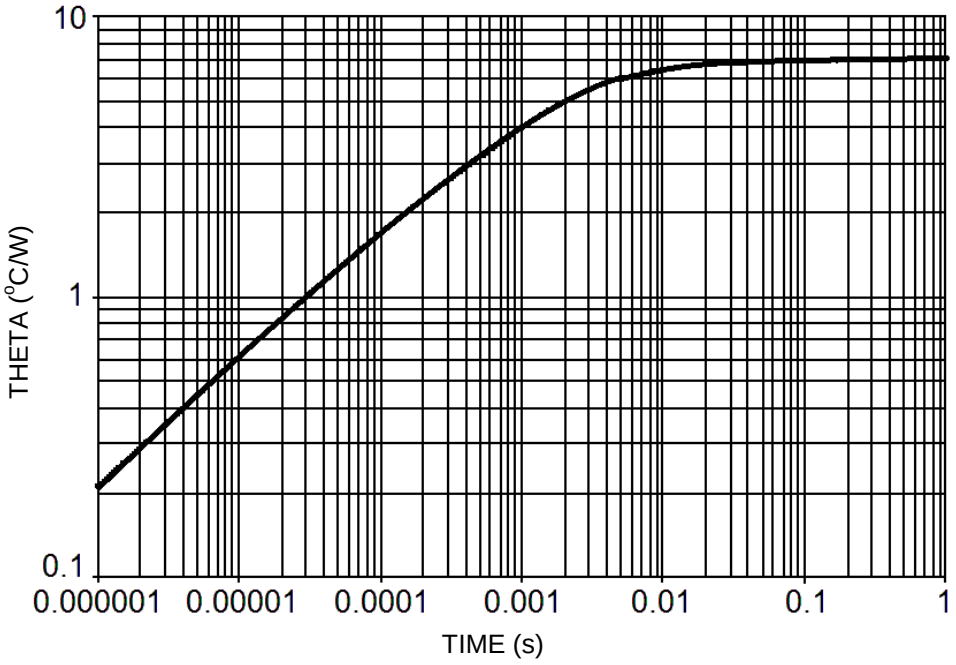
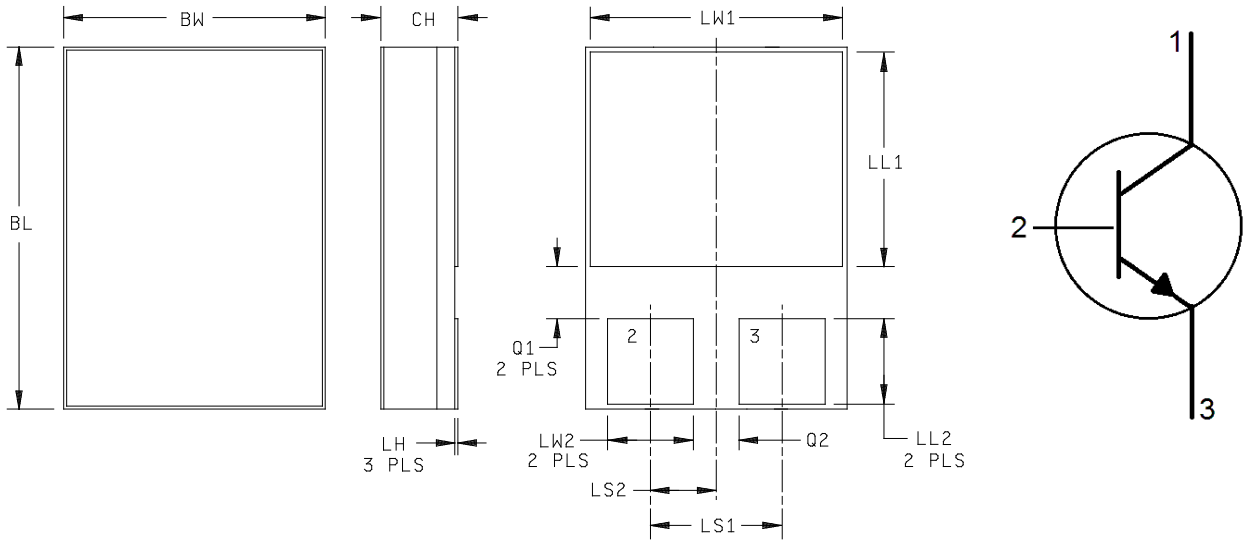


FIGURE 2
Maximum Thermal Impedance ($R_{\Theta JC}$)

PACKAGE DIMENSIONS



NOTES:

1. Dimensions are in inches.
2. Millimeter equivalents are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	0.215	0.225	5.46	5.72
BW	0.145	0.155	3.68	3.94
CH	0.049	0.075	1.24	1.91
LH		0.02		0.51
LW1	0.135	0.145	3.43	3.68
LW2	0.047	0.057	1.19	1.45
LL1	0.085	0.125	2.16	3.17
LL2	0.045	0.075	1.14	1.90
LS1	0.070	0.095	1.78	2.41
LS2	0.035	0.048	0.89	1.21
Q1	0.03	0.070	0.76	1.78
Q2	0.02	0.035	0.51	0.88
TERMINAL				
1	COLLECTOR			
2	BASE			
3	EMITTER			